STATE OF MISSOURI

PERMIT BOOK

DEPARTMENT OF NATURAL RESOURCES

MISSOURI AIR CONSERVATION COMMISSION

PERMIT TO CONSTRUCT

Under the authority of RSMo 643 and the Federal Clean Air Act the applicant is authorized to construct the air contaminant source(s) described below, in accordance with the laws, rules and conditions as set forth herein.

Permit Number: 082015-014

Project Number: 2015-04-012
Installation Number: 095-0011

Parent Company: Bayer CropScience LP

Parent Company Address: 2 T.W. Alexander Drive, Research Triangle Park, NC 27709

Installation Name: Bayer CropScience

Installation Address: 8400 Hawthorn Road, Kansas City, MO 64120

Location Information: Jackson County, S29, T50N, R32W

Application for Authority to Construct was made for:
Installation of a new process for treating wastewater generated by the Formulation Plants (K1, K2, K3, K4). This review was conducted in accordance with Section (5), Missouri State Rule 10 CSR 10-6.060, *Construction Permits Required*.

☐ Standard Conditions (on reverse) are applicable to this permit.

☑ Standard Conditions (on reverse) and Special Conditions are applicable to this permit.

Prepared by
Susan Heckenkamp
New Source Review Unit

Director or Designee
Department of Natural Resources

AUG 21 2015

Effective Date

STANDARD CONDITIONS:

Permission to construct may be revoked if you fail to begin construction or modification within two years from the effective date of this permit. Permittee should notify the Air Pollution Control Program if construction or modification is not started within two years after the effective date of this permit, or if construction or modification is suspended for one year or more.

You will be in violation of 10 CSR 10-6.060 if you fail to adhere to the specifications and conditions listed in your application, this permit and the project review. In the event that there is a discrepancy between the permit application and this permit, the conditions of this permit shall take precedence. Specifically, all air contaminant control devices shall be operated and maintained as specified in the application, associated plans and specifications.

You must notify the Department's Air Pollution Control Program of the anticipated date of start up of these air contaminant sources. The information must be made available within 30 days of actual startup. Also, you must notify the Department of Natural Resources' regional office responsible for the area within which you are located within 15 days after the actual start up of these air contaminant sources.

A copy of this permit and permit review shall be kept at the installation address and shall be made available to Department of Natural Resources' personnel upon request.

You may appeal this permit or any of the listed special conditions to the Administrative Hearing Commission (AHC), P.O. Box 1557, Jefferson City, MO 65102, as provided in RSMo 643.075.6 and 621.250.3. If you choose to appeal, you must file a petition with the AHC within 30 days after the date this decision was mailed or the date it was delivered, whichever date was earlier. If any such petition is sent by registered mail or certified mail, it will be deemed filed on the date it is mailed. If it is sent by any method other than registered mail or certified mail, it will be deemed filed on the date it is received by the AHC.

If you choose not to appeal, this certificate, the project review and your application and associated correspondence constitutes your permit to construct. The permit allows you to construct and operate your air contaminant sources(s), but in no way relieves you of your obligation to comply with all applicable provisions of the Missouri Air Conservation Law, regulations of the Missouri Department of Natural Resources and other applicable federal, state and local laws and ordinances.

The Air Pollution Control Program invites your questions regarding this air pollution permit. Please contact the Construction Permit Unit at (573) 751-4817. If you prefer to write, please address your correspondence to the Missouri Department of Natural Resources, Air Pollution Control Program, P.O. Box 176, Jefferson City, MO 65102-0176, attention: Construction Permit Unit.

SPECIAL CONDITIONS:

The permittee is authorized to construct and operate subject to the following special conditions:

The special conditions listed in this permit were included based on the authority granted the Missouri Air Pollution Control Program by the Missouri Air Conservation Law (specifically 643.075) and by the Missouri Rules listed in Title 10, Division 10 of the Code of State Regulations (specifically 10 CSR 10-6.060). For specific details regarding conditions, see 10 CSR 10-6.060 paragraph (12)(A)10. "Conditions required by permitting authority."

Bayer CropScience
Jackson County, S29, T50N, R32W

1. Superseding Condition
   A. The conditions of this permit supersede Special Condition 2 found in the previously issued construction permit #062015-006 issued by the Air Pollution Control Program.

2. VOC and HAPs Emission Limitations
   A. Bayer CropScience shall not exceed the annual plant-wide emission limitations for any pollutant listed in Table 1. All limitations are based on a consecutive 12-month period. This limit applies to the emissions from all equipment/processes installed or permitted at Bayer CropScience as of the issuance date of this permit.

Table 1: Installation-Wide Emission Limitations

Pollutant	Plant-Wide Limitation
PM_{10}	99.0
SOx	99.0
NOx	99.0
VOC	99.0
CO	99.0
Any individual HAP	9.9
Combined HAPs	24.9

   B. Bayer CropScience shall develop and use forms to demonstrate compliance with Special Condition 2.A. The forms shall contain at a minimum the following information,
      1) Installation name
      2) Installation ID
      3) Permit number
      4) Current month
      5) Pollutant
      6) Emission units
      7) Each emission unit's respective current monthly throughput
      8) Each emission unit's respective emission factor and emission factor source

SPECIAL CONDITIONS:
The permittee is authorized to construct and operate subject to the following special conditions:

9) Total pollutant emissions for the month
10) 12-month rolling total pollutant emissions
11) Indication of compliance status with Special Condition 2.A.

C. As available, the emission factors and demonstrated control efficiencies developed from the most recent performance testing shall be used in the recordkeeping developed under Special Condition 2.B.

3. Control Device – Caustic Scrubber System (FEN-CD-1) Requirements

A. Bayer CropScience shall control emissions from the Fenton plant (EP20) using a caustic scrubber system as specified in the permit application.

B. Bayer CropScience shall establish operating limits for minimum pressure drop across the caustic scrubber system, minimum pH of the liquid in the scrubber circulation line, and minimum liquid flow rate into the scrubber based upon manufacturer specifications. The liquid flow rate into the scrubber serves as a surrogate for the liquid-to-gas ratio as the gas flowrate to the scrubber remains relatively constant.

C. On-going compliance will be demonstrated if the daily average values of the operating parameters are above the operating parameter limits. Bayer CropScience shall record the daily average of each of the following parameters: pressure drop across the caustic scrubber system, pH of the liquid in the scrubber circulation line, and the liquid flow rate into the scrubber.

D. The caustic scrubber system and any related instrumentation or equipment shall be operated and maintained in accordance with the manufacturer's specifications, which shall be kept on site.

E. Sodium hydroxide solution shall be used as the scrubbing liquid in the scrubber.

F. Bayer CropScience shall maintain an operating and maintenance log for the wet scrubber that shall include the following:
1) Incidents of malfunction, with impact on emissions, duration of event, probable cause, and corrective actions; and
2) Maintenance activities, with inspection schedule, repair actions, and replacements, etc.
3) Dates of all above schedules, incidents, activities, and actions.

4. Record Keeping and Reporting Requirements

A. Bayer CropScience shall maintain all records required by this permit for not less than five years and shall make them available immediately to any

SPECIAL CONDITIONS:

The permittee is authorized to construct and operate subject to the following special conditions:

Missouri Department of Natural Resources' personnel upon request. These records shall include SDS for all materials used.

B. Bayer CropScience shall report to the Air Pollution Control Program's Compliance/Enforcement Section, P.O. Box 176, Jefferson City, MO 65102, no later than 10 days after the end of the month during which any record required by this permit show an exceedance of a limitation imposed by this permit.

REVIEW OF APPLICATION FOR AUTHORITY TO CONSTRUCT AND OPERATE
SECTION (5) REVIEW
Project Number: 2015-04-012
Installation ID Number: 095-0011
Permit Number:

Installation Address:
Bayer CropScience
8400 Hawthorn Road
Kansas City, MO 64120

Parent Company:
Bayer CropScience LP
2 T.W. Alexander Drive
Research Triangle Park, NC 27709

Jackson County, S29, T50N, R32W

REVIEW SUMMARY

- Bayer CropScience has applied for authority to install a new process for treating wastewater generated by the Formulation Plants (K1, K2, K3, K4).
- The application was deemed complete on April 6, 2015.
- HAP emissions are not expected from the proposed equipment.
- None of the New Source Performance Standards (NSPS) apply to the installation.
- 40 CFR 63 Subpart VVVVVV – *National Emission Standard for Hazardous Air Pollutants for Chemical Manufacturing Area Sources* (MACT 6V) does not apply to the wastewater generated by the formulation plants. Wastewater that is being treated comes from formulation plants that are not subject to MACT 6V.
- A caustic scrubber system is being used to control the VOC and SO_2 emissions generated from the Fenton reactors that are being used to treat the Formulation Plants wastewater.
- This review was conducted in accordance with Section (5) of Missouri State Rule 10 CSR 10-6.060, *Construction Permits Required*. Potential emissions of all pollutants are below de minimis levels. Uncontrolled levels of VOC were above the 2.75 lb/hour VOC threshold in 10 CSR 6.061(3)(A)3; thus a permit is required.
- This installation is located in Jackson County, a maintenance area for ozone and an attainment area for all other criteria pollutants.
- This installation is on the List of Named Installations found in 10 CSR 10-6.020(3)(B), Table 2. The installation's major source level is 100 tons per year and fugitive emissions are counted toward major source applicability.

- Ambient air quality modeling was not performed since potential emissions of the application are below de minimis levels.

- Emissions testing for purposes of this permit is not required for the equipment associated with the Fenton process.

- A revision to your Part 70 Operating Permit application is required for this installation within 1 year of equipment startup.

- Approval of this permit is recommended with special conditions.

INSTALLATION DESCRIPTION

Bayer CropScience (Bayer) operates an industrial chemical manufacturing plant at 8400 Hawthorn Road in Jackson County, Kansas City, Missouri. The main products are crop protection chemicals. The facility is comprised of chemical manufacturing, chemical formulation, and auxiliary operations. Auxiliary operations include: a wastewater treatment plant, a hazardous waste combustor, boilers, utilities, laboratories, and maintenance.

Bayer combusts the liquid hazardous wastes that result from the manufacture of agricultural chemicals. The combustor exhaust gas is controlled by a high-energy venturi wet scrubber, a low-energy packed bed wet scrubber, and a fiber bed mist eliminator.

Bayer is Part 70 source and currently has an application undergoing technical review (Project No. 2013-12-029).

The following New Source Review permits have been issued to Bayer CropScience from the Air Pollution Control Program.

Table 1: Permit History[1]

Permit	App Received	Permit /letter Signed	Permit /letter Sent	Purpose
US EPA			11/8/1978	PSD permit for wastewater treatment at the Chemagro Agricultural division
0697B	4/15/1998			
0781	2/4/1997	3/31/1997	4/1/1997	
0795	3/28/1997	7/23/1997	8/6/1997	Catalytic oxidizer at liquid formulation plant
0825	2/4/1998			Construction of new herbicide formulation plant
0836	3/18/1998			
0873	3/1/1999	3/9/1999	3/11/1999	
0911	6/29/2000	10/18/2000	10/18/2000	Pharmaceutical plant
0941	11/1/2000	11/13/2000	11/15/2000	MKH manufacturing

[1] The permit history listed in Table 1 is not complete. Permits that no longer have applicable requirements or conditions may not have been included.

Permit	App Received	Permit /letter Signed	Permit /letter Sent	Purpose
0946	1/31/2001	3/14/2001	3/14/2001	500KW EG
0976	12/31/2001	2/7/2002	2/21/2002	New Metosulam (CONFIDENTIAL)
1024	3/28/2003	7/1/2003	7/1/2003	New Fungicide (CONFIDENTIAL)
1032	6/12/2003	8/8/2003	8/8/2003	Production of Phenyl Aldol (Confidential)
1035	7/1/2003	9/9/2003	9/9/2003	Production of Mesosulfuron (Confidential)
0697C	8/28/2003	9/18/2003	9/18/2003	Oxidizer Routing
1123	9/15/2005	6/20/2006		New back up TO (#3)
1234	5/14/2008	8/21/2008		New Products
1260	2/18/2009	3/13/2009	3/13/2009	Temporary Portable TO
1263	1/20/2009	3/ 11/2009	3/11/2009	Herbicide Production
1285	9/1/2009	11/30/2009	11/30/2009	JAU expansion project
1299	7/13/2010			To clean up both CP#1123 and 1285. No charge
1353	8/27/2012	9/13/2012	9/13/2012	Temporary thermal oxidizer.
1371	6/6/2013	9/13/2013	9/13/2013	Temporary Thermal oxidizer
1391	6/16/2014	7/22/2014	7/22/2014	Temporary Thermal oxidizer
1398	9/5/2014	9/15/2014	9/15/2014	Temporary boiler
062015-006	7/28/2014	6/10/2015	6/10/2015	Installation of a· new vent gas incinerator With a waste heat boiler and a quench/scrubbing system.

PROJECT DESCRIPTION

Bayer is seeking authority to install a new process for treating wastewater generated by the Formulation Plants (K1, K2, K3, K4) at their Kansas City Production facility. The project includes the addition of equipment for the Fenton process (EP20) in which the remaining active ingredients contained in the wastewaters from the Formulation Plants are chemically oxidized and neutralized. The emissions generated by the reduction reactions include CO_2, VOC and SO_2. Emissions from the reactors are routed through a caustic scrubber system (FEN-CD1) that removes a portion of the SO_2 and VOC which are present in the form of volatile organic acids. Subsequent processing steps of the wastewater are aqueous with the no further expected regulated emissions.

In order to include the VOC and SO_2 emissions associated with the new equipment into the installation-wide limit established in Permit No. 062014-006, Special Condition 2 of that permit was superseded and reestablished in Special Condition 2 of this permit.

EMISSIONS/CONTROLS EVALUATION

The emission estimates are based on the following assumptions that are generally dependent upon the process and the unique characteristics of the Formulation wastewater being treated. The complete calculations and justifications are located in Appendix B. A process flow diagram of the process is included in Appendix C.

The design value of the Fenton Plant is based on a chemical oxygen demand (COD) loading of 1,400 kilograms per day. The COD concentration and hydraulic loading are measured daily in order to estimate the amount of peroxide needed to treat the wastewater. Since the system is not designed to handle higher amounts of COD, waste water storage tanks will be used to store waste water until the Fenton Plant can handle the load or the waste water will be managed by other means.

The calculations submitted were altered slightly to account for possible higher sulfur content in the pesticide active ingredients that get converted to SO_2. A value of 30.6% sulfur content is the highest possible of any active ingredient. Please note that the average of all active ingredients are estimated to be 5% and therefore SO_2 emissions are likely to be even lower than the given amount in Table 2.

Emission rates of CO_2, VOC and SO_2 were calculated based on the estimated maximum amount of organic carbon compounds in the wastewater measured as total organic carbon (TOC) and chemical oxygen demand (COD) concentrations. The caustic scrubber system is designed to remove 90% of the SO_2 and VOC.

The following table provides an emissions summary for this project. Existing potential emissions were taken from the previous permit. Existing actual emissions were taken from the installation's 2014 EIQ. Potential emissions of the application represent the potential of the new equipment, assuming continuous operation (8760 hours per year).

Table 2: Emissions Summary (tons per year)

Pollutant	Regulatory *De Minimis* Levels	Existing Potential Emissions	Existing Actual Emissions (2014 EIQ)	Controlled Potential Emissions of the Application	New Installation Conditioned Potential
PM	25.0	N/D	N/D	N/A	N/A
PM_{10}	15.0	<99.0	4.94	N/A	<99.0
$PM_{2.5}$	10.0	N/D	4.94	N/A	N/A
SOx	40.0	<99.0	2.18	1.16	<99.0
NOx	40.0	<99.0	57.75	N/A	<99.0
VOC	40.0	<99.0	20.64	2.89	<99.0
CO	100.0	<99.0	30.37	N/A	<99.0
GHG (CO_2e)	N/A	N/D	N/D	5.26	N/A
GHG (mass)	0.0	N/D	N/D	5.26	N/A
HAPs	10.0/25.0	<24.9	N/D	N/A	<24.9

N/A = Not Applicable; N/D = Not Determined

PERMIT RULE APPLICABILITY

This review was conducted in accordance with Section (5) of Missouri State Rule 10 CSR 10-6.060, *Construction Permits Required*. Potential emissions of all pollutants are below de minimis levels. Uncontrolled levels of VOC were above the 2.75 lb/hour VOC threshold in 10 CSR 6.061(3)(A)3; thus a permit is required.

APPLICABLE REQUIREMENTS

Bayer CropScience shall comply with the following applicable requirements. The Missouri Air Conservation Laws and Regulations should be consulted for specific record keeping, monitoring, and reporting requirements. Compliance with these emission standards, based on information submitted in the application, has been verified at the time this application was approved. For a complete list of applicable requirements for your installation, please consult your operating permit.

GENERAL REQUIREMENTS

- *Submission of Emission Data, Emission Fees and Process Information,* 10 CSR 10-6.110
- *Operating Permits*, 10 CSR 10-6.065
- *Restriction of Particulate Matter to the Ambient Air Beyond the Premises of Origin*, 10 CSR 10-6.170
- *Restriction of Emission of Visible Air Contaminants*, 10 CSR 10-6.220
- *Restriction of Emission of Odors*, 10 CSR 10-6.165

SPECIFIC REQUIREMENTS

- *Restriction of Emission of Sulfur Compounds*, 10 CSR 10-6.260

STAFF RECOMMENDATION

On the basis of this review conducted in accordance with Section (5), Missouri State Rule 10 CSR 10-6.060, *Construction Permits Required*, it is recommended that this permit be granted with special conditions.

PERMIT DOCUMENTS

The following documents are incorporated by reference into this permit:

- The Application for Authority to Construct form, dated February 5, 2015, received April 5, 2015, designating Bayer CropScience LP as the owner and operator of the installation.

APPENDIX A

Abbreviations and Acronyms

% ..... percent
ºF ..... degrees Fahrenheit
acfm ..... actual cubic feet per minute
BACT ..... Best Available Control Technology
BMPs ..... Best Management Practices
Btu..... British thermal unit
CAM ..... Compliance Assurance Monitoring
CAS..... Chemical Abstracts Service
CEMS ..... Continuous Emission Monitor System
CFR ..... Code of Federal Regulations
CO ..... carbon monoxide
CO_2..... carbon dioxide
CO_2e..... carbon dioxide equivalent
COMS..... Continuous Opacity Monitoring System
CSR..... Code of State Regulations
dscf ..... dry standard cubic feet
EIQ ..... Emission Inventory Questionnaire
EP..... Emission Point
EPA ..... Environmental Protection Agency
EU..... Emission Unit
fps ..... feet per second
ft ..... feet
GACT ..... Generally Available Control Technology
GHG ..... Greenhouse Gas
gpm..... gallons per minute
gr..... grains
GWP..... Global Warming Potential
HAP..... Hazardous Air Pollutant
hr..... hour
hp ..... horsepower
lb ..... pound
lbs/hr..... pounds per hour
MACT ..... Maximum Achievable Control Technology
$\mu g/m^3$..... micrograms per cubic meter
m/s ..... meters per second
Mgal ..... 1,000 gallons
MW ..... megawatt
MHDR..... maximum hourly design rate
MMBtu.... Million British thermal units
MMCF..... million cubic feet
MSDS ..... Material Safety Data Sheet
NAAQS... National Ambient Air Quality Standards
NESHAPs National Emissions Standards for Hazardous Air Pollutants
NO_x..... nitrogen oxides
NSPS..... New Source Performance Standards
NSR..... New Source Review
PM ..... particulate matter
$PM_{2.5}$..... particulate matter less than 2.5 microns in aerodynamic diameter
PM_{10}..... particulate matter less than 10 microns in aerodynamic diameter
ppm..... parts per million
PSD ..... Prevention of Significant Deterioration
PTE..... potential to emit
RACT..... Reasonable Available Control Technology
RAL ..... Risk Assessment Level
SCC..... Source Classification Code
scfm ..... standard cubic feet per minute
SDS ..... Safety Data Sheet
SIC..... Standard Industrial Classification
SIP..... State Implementation Plan
SMAL ..... Screening Model Action Levels
SO_x..... sulfur oxides
SO_2..... sulfur dioxide
tph..... tons per hour
tpy ..... tons per year
VMT..... vehicle miles traveled
VOC..... Volatile Organic Compound

Appendix B

Emission Calculations

$$E_{VOC,v} = M_{TOC,ww} \times F_{TOC,v} \times F_{VOC,v} \times \frac{MW_{VOC}}{AW_C \times A_{C,VOC}} \times \frac{day}{24\ hrs}$$

$$E_{CO2,v} = M_{TOC,ww} \times F_{TOC,v} \times F_{CO2,v} \times \frac{MW_{CO2}}{AW_C \times A_{C,CO2}} \times \frac{day}{24\ hrs}$$

$$E_{SO2,v} = M_{AI,ww} \times F_{S,v} \times F_{SO2\ conv} \times \frac{MW_{SO2}}{AW_S \times A_{S,SO2}} \times \frac{day}{24\ hrs}$$

} before the scrubber

Parameter	Units	Value	Description	Source
Emission rate values				
$E_{VOC,v}$	lbs/hr	6.6	emission rate of VOCs (as propionic acid)	calculated
$E_{CO2,v}$	lbs/hr	12	emission rate of CO2	calculated
$E_{SO2,v}$	lbs/hr	0.43	emission rate of SO2	calculated
Mass flow rate values and associated parameters				
$M_{TOC,ww}$	lbs/day	1,543	TOC loading in the wastewater stream $M_{TOC,ww} = FR_{ww} \times \frac{C_{TOC,ww}}{10^6} \times D_{ww} \times 2.2046\ lbs/kg$	calculated
$M_{AI,ww}$	lbs/day	1,029	AI loading in the wastewater stream $M_{AI,ww} = FR_{ww} \times \frac{C_{AI,ww}}{10^6} \times D_{ww} \times 2.2046\ lbs/kg$	calculated
FR_{ww}	m^3/day	40	maximum design wastewater throughput	design value
$C_{TOC,ww}$	ppm	17,500	TOC concentration in the wastewater $C_{TOC,ww} = C_{COD,ww} \times \frac{1}{R_{COD/TOC}}$	calculated
$C_{COD,ww}$	ppm	35,000	COD concentration in wastewater	design value
$R_{COD/TOC}$	lbs COD/lbTOC	2	ratio of COD to TOC	assumption
D_{ww}	kg/m^3	1,000	density of the wastewater	physical property
$C_{AI,ww}$	ppm	11,667	AI concentration in wastewater $C_{AI,ww} = C_{COD,ww} \times \frac{1}{R_{COD/AI}}$	calculated
$R_{COD/AI}$	lbs COD/lb AI	3	ratio of COD to AI	assumption
Parameters for estimating vent stream composition				
$F_{TOC,v}$		0.1	fraction of TOC in wastewater reduced and present in the vent stream	assumption
$F_{VOC,v}$		0.5	fraction of the TOC in the vents that is VOC	assumption
$F_{CO2,v}$		0.5	fraction of the TOC in the vents that is CO2	assumption
$F_{S,v}$		0.31	fraction of sulfur in the AI	assumption
$F_{SO2\ conv}$		0.1	fraction of sulfur in the AI converted to SO2	assumption
MW_{VOC}	lbs/lb-mole	74.08	molecular weight of VOC (as propionic acid)	physical property
AW_C	lbs/lb-mole	12.01	atomic weight of carbon	physical property
$A_{C,VOC}$	atoms	3	number of carbon atoms in VOC (as propionic acid)	physical property
MW_{CO2}	lbs/lb-mole	44.01	molecular weight of CO2	physical property
$A_{C,CO2}$	atoms	1	number of carbon atoms in CO2	physical property
MW_{SO2}	lbs/lb-mole	64.066	molecular weight of SO2	physical property
AW_S	lbs/lb-mole	32.065	atomic weight of sulfur	physical property
$A_{S,SO2}$	atoms	1	number of sulfur atoms in SO2 molecule	physical property

VOC	volatile organic compounds
CO2	carbon dioxide
SO2	sulfur dioxide
TOC	total organic carbon
AI	pesticide active ingredient
COD	chemical oxygen demand

Appendix B

Estimate of Atmospheric Emissions

Parameter	Units	VOCs	CO2	SO2
Emission rate into the scrubber	lbs/hr	6.6	12	2.63
Emission rate into the scrubber	lbs/yr	57,816	105,120	23,053
Control efficiency of the scrubber ($RE_{scrubber}$)	%	90	90	90
Atmospheric emission rate	lbs/hr	0.66	1.2	0.26
Annual emissions	lbs/yr	5,782	10,512	2,303

Design Values

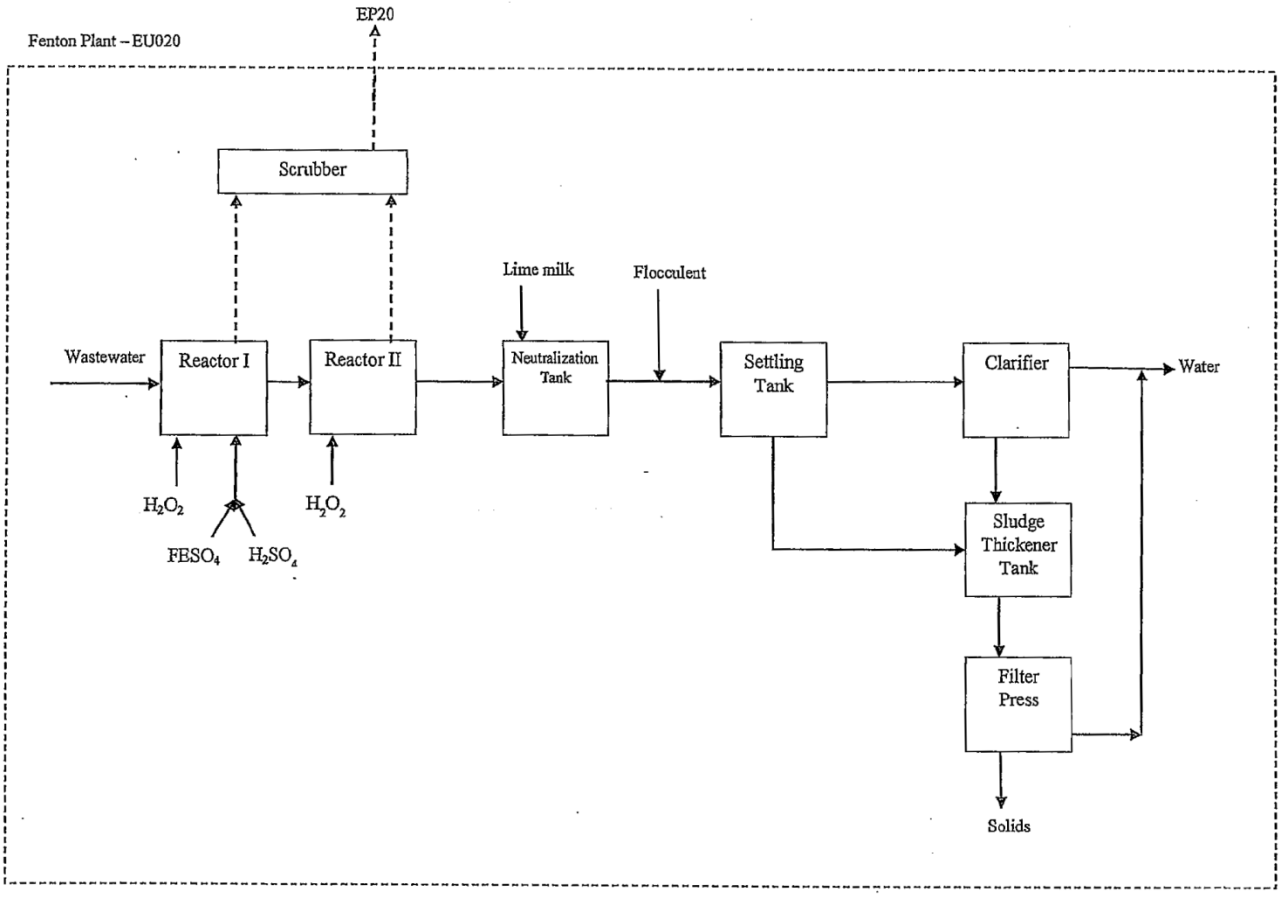
Parameter	Value / Units	Basis
FR_{ww}	40 m^3/day	The design value is based on the current hydraulic loading plus anticipated future expansion over the next 10 years [14 m^3/d + (2.5 m^3/day each year x 10 years]
$C_{COD,ww}$	35,000 ppm	Based on the overall average of 65 samples taken between 4/15/2013 and 5/31/2013 from the four Formulation plants plus a 10% safety factor
$M_{COD,ww}$	1,400 kg/day	COD Loading: Together the design wastewater flow rate and average COD concentration establish the design COD loading. The COD loading between 4/15/2013 and 5/31/2013 was lower than the design treatment capacity all of the time except for one outlier. Under such conditions, the addtional COD load that cannot be treated in the Fenton unit will be stored in the waste water storage tanks. At a more realistic flow rate, this equivalent to five days worth of storage capacity.

Assumptions

Parameter	Value / Units	Basis
		TOC reduction is the same as COD reduction
		The vent stream from the Fenton unit primarily consists of CO2 and low molecular weight (C1-C5) carboxylic acids arising from the TOC reduction. The vent stream will also contain minor amounts of SO2 from the sulfur present in the pesticide active ingredients (AI).
		The carboxylic acids are VOCs and for the purpose of the emissions estimate are considered to be propionic acid (79-09-4).
		There is the potential for a portion of the TOC present in the wastewater to be hazardous air pollutants (HAPs) of which xylene is the most volatile. It is assumed, however, that all organic HAP compounds, as well as VOC compounds, are reduced to CO2 or a carboxylic acid. Therefore, no HAP emissions are expected from the Fenton process.
$R_{COD/TOC}$	2 lbs COD / lb TOC	Conservative estimate based on internal evaluation. Theoretical estimates put this value between 2-3 pounds COD needed for every pound of TOC.
$R_{COD/AI}$	3 lbs COD / lb AI	Based on the COD to AI values from two raw wastewater samples taken during the summer of 2013.
$F_{TOC,v}$	0.1	Estimate of the fraction of TOC in the wastewater reduced through the Fenton process and present in the vent stream. Based on limited laboratory testing.
$F_{VOC,v}$	0.5	Vents will mostly consist of CO2 and carboxcylic acids arising from the TOC reduction. It is assumed that the carbon is equally split between CO2 and the caboxylic acids based on information provided by the vendor, Eisenmann.
$F_{CO2,v}$	0.5	
$F_{S,v}$	30.6	Estimate based on the average sulfur content of pesticide active ingredients (AI) expected to be present in the wastewater.
$F_{SO2\ conv}$	0.1	Estimate of the fraction of sulfur in the pesticide active ingredients (AI) that gets converted to SO2. Expected to be a conservative estimate as the preferred path for sulfur is to produce sulfate in the liquid phase.
$RE_{scrubber}$	90 %	It is assumed that the removal efficiency of the scrubber for all three pollutants is the same and equal to 90%.

Appendix C

PROCESS FLOW DIAGRAM – FENTON PROCESS



Mr. Scott Munk
Air Quality Specialist
Bayer CropScience
P.O. Box 4913
Kansas City, MO 64120

RE: New Source Review Permit - Project Number: 2015-04-012

Dear Mr. Munk:

Enclosed with this letter is your permit to construct. Please study it carefully and refer to Appendix A for a list of common abbreviations and acronyms used in the permit. Also, note the special conditions on the accompanying pages. The document entitled, "Review of Application for Authority to Construct," is part of the permit and should be kept with this permit in your files. Operation in accordance with these conditions, your new source review permit application and with your amended operating permit is necessary for continued compliance. The reverse side of your permit certificate has important information concerning standard permit conditions and your rights and obligations under the laws and regulations of the State of Missouri.

If you were adversely affected by this permit decision, you may be entitled to pursue an appeal before the administrative hearing commission pursuant to Sections 621.250 and 643.075.6 RSMo. To appeal, you must file a petition with the administrative hearing commission within thirty days after the date this decision was mailed or the date it was delivered, whichever date was earlier. If any such petition is sent by registered mail or certified mail, it will be deemed filed on the date it is mailed; if it is sent by any method other than registered mail or certified mail, it will be deemed filed on the date it is received by the Administrative Hearing Commission, Truman State Office Building, Jefferson City, MO 65102, phone: 573-751-2422, fax: 573-751-5018, website: www.oa.mo.gov/ahc. If you have any questions regarding this permit, please do not hesitate to contact me, at the Department of Natural Resources' Air Pollution Control Program, P.O. Box 176, Jefferson City, MO 65102 or at (573) 751-4817.

Sincerely,

AIR POLLUTION CONTROL PROGRAM

Susan Heckenkamp
New Source Review Unit Chief

SH:shl

Enclosures

c: Kansas City Regional Office
PAMS File: 2015-04-012
Permit Number: